

WHAT IS CLAIMED IS:

1. A torque sensor comprising:

a first magnetic shaft;

a second shaft elastically rotatably connected to the  
5 first shaft;

a nonmagnetic cylindrical magnetism leakage preventing  
member made of synthetic resin covering an outer periphery of  
the first shaft;

a magnetic first detecting cylinder covering an outer  
10 periphery of the magnetism leakage preventing member;

a magnetic second detecting cylinder integrally  
rotatable with the second shaft, one end of which is opposed  
to one end of the first detecting cylinder with a clearance;  
and

15 a first coil constituting a first magnetic circuit by  
generating magnetic flux passing the one end of the first  
detecting cylinder and the one end of the second detecting  
cylinder, wherein a reluctance with respect to the passing  
magnetic flux in the first magnetic circuit is changed in  
20 accordance with an elastic relative rotational amount by a  
change in a transmitting torque of the first and second shafts,

wherein the magnetism leakage preventing member is  
molded in a state that the first shaft is inserted into the  
first detecting cylinder, so that the first detecting cylinder  
25 and the first shaft are integrated to the magnetism leakage

preventing member.

2. The torque sensor according to claim 1 further comprising:

5 a magnetic third detecting cylinder integrally rotatable with the first shaft, one end of which is opposed to other end of the first detecting cylinder with a clearance; and

10 a second coil constituting a second magnetic circuit by generating magnetic flux passing the other end of the first detecting cylinder and the one end of the third detecting cylinder,

15 wherein the torque transmitted by the first and second shafts is detected based on a deviation between a value in correspondence with a change in the reluctance with respect to the passing magnetic flux in the first magnetic circuit and a value in correspondence with a change in the reluctance with respect to the passing magnetic flux in the second magnetic circuit, and

20 wherein the magnetism leakage preventing member is molded in a state that the first shaft is inserted into the first detecting cylinder and the third detecting cylinder, so that the first detecting cylinder, the third detecting cylinder and the first shaft are integrated to the magnetism  
25 leakage preventing member.

3. The torque sensor according to claim 1, wherein the first shaft is provided with an axial direction displacement restricting portion for restricting a displacement of the magnetism leakage preventing member in an axial direction of the first shaft.

4. The torque sensor according to claim 3, wherein the axial direction displacement restricting portion includes at least one circumferential groove provided at the outer periphery of the first shaft, and

wherein the magnetism leakage preventing member includes at least one ring-shape projected portion for fitting with the at least one circumferential groove.

5. The torque sensor according to claim 4, wherein a plurality of the circumferential grooves are provided at the outer periphery of the first shaft at intervals in the axial direction, and a plurality of the projected portions are provided at the magnetism leakage preventing member so as to correspond to the plurality of the circumferential grooves.

6. The torque sensor according to claim 1, wherein the first shaft is provided with a circumferential direction displacement restricting portion for restricting a

displacement of the magnetism leakage preventing member in a circumferential direction of the first shaft.

7. The torque sensor according to claim 6, wherein the  
5 circumferential direction displacement restricting portion includes at least one axial groove provided at the outer periphery of the first shaft, and

the magnetism leakage preventing member includes at least one axial projected streak for fitting with the at least  
10 one axial groove.

8. The torque sensor according to claim 7, wherein a plurality of the axial grooves are provided at the outer periphery of the first shaft at intervals in the  
15 circumferential direction, and a plurality of the axial projected streaks are provided at the magnetism leakage preventing member so as to corresponds to the plurality of the axial grooves.

20 9. A method of manufacturing a torque sensor including: a first magnetic shaft; a second shaft elastically rotatably connected to the first shaft; a nonmagnetic cylindrical magnetism leakage preventing member made covering an outer periphery of the first shaft; a magnetic first detecting  
25 cylinder covering an outer periphery of the magnetism leakage

preventing member; a magnetic second detecting cylinder integrally rotatable with the second shaft, one end of which is opposed to one end of the first detecting cylinder with a clearance; and a first coil constituting a magnetic circuit  
5 by generating magnetic flux passing the one end of the first detecting cylinder and the one end of the second detecting cylinder, wherein a reluctance with respect to the passing magnetic flux in the first magnetic circuit is changed in accordance with an elastic relative rotational amount by a  
10 change in a transmitting torque of the first and second shafts, the method comprising the steps of:

providing a molding die for molding the magnetism leakage preventing member;

inserting the first shaft and the first detecting  
15 cylinder into the molding die; and

after the inserting step, injecting a synthetic resin into the molding die to mold the magnetism leakage preventing member, so that the first shaft and the first detecting cylinder are integrated to the magnetism leakage preventing member.

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